HSEA87D-0625-066

MARTIN MARIETTA

Internal Correspondence

MARTIN MARIETTA ENERGY SYSTEMS, INC.

June 25, 1987

Y-12 SITE
DOCUMENT RESPONSE CENTER

S. D. Arnett

Health Physics Recommendations Associated With
Increased Tritium Level in Heavy Water Shipments

Due to the increase in tritium levels in shipments of heavy water from Savannah River Operations (SRO), I have reevaluated the health physics concerns associated with 9204-2 deuterium production operations. Recommended limits are derived from the International Commission on Radiological Protection, Publication 30 (ICRP 30), *Limits for Intakes of Radionuclides by Workers*, and DOE Order 5480.1A, Chapter 11, *Radiation Protection*.

Although increased concentrations in heavy water will range from 0.003 µCi/mL to 0.4 µCi/mL, calculations were performed using the maximum value in order to provide a conservative estimate of potential exposure to workers. ICRP 30 recommends a maximum tritium intake by ingestion or inhalation of 81,000 µCi annually, which corresponds to an intake of 202.5 liters (53.5 gallons) of heavy water at the maximum tritium concentration. Maximum air concentrations should be below 5 µCi/m³ for tritiated water vapor, based on standard occupational breathing levels for a 40-hour week and a 50-week year.

In a worse-case scenario, with 100 percent saturated air at 70°F and with the maximum tritium concentration in heavy water, recommended air concentrations could be exceeded in localized areas. Although this scenario is highly unlikely, I recommend the following actions to assure that exposures are kept as low as reasonably achievable:

1. Heavy water should be stored in closed containers and processed in a manner that minimizes evaporation.

2. Nonpermeable gloves should be used by all employees whose hands come in contact with heavy water due to the risk of skin absorption. For the same reason, other skin contact should be avoided.

3. A list of employees involed in the processing of heavy water should be forwarded to the Radiation Safety Department for possible inclusion in the urinalysis program.

4. An audit should be performed by health physics and supervisory personnel to identify any other potential risks to employees.

It should be noted that tritium in its natural gaseous state is far less hazardous (by four orders of magnitude) than tritiated water (liquid or

#485

vapor). For this reason, containment controls should be concentrated on the processing of heavy water as noted in these recommendations.

Please feel free to call me if you have any questions.

J. B. Hunt

J. B. Hunt, 9711-1, MS 3 (4-3547) - NoRC

JBH:ps

cc: W. T. Mee
W. A. Muenzer
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File - JBH

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Internal Correspondence

MARTIN MARIETTA ENERGY SYSTEMS, INC.

October 27, 1986

Distribution

Subject: Heavy Water Tritium Levels

All deuterium gas customers should be notified of a future change in the heavy water tritium levels. SRO has a depleted inventory of "low level" tritium water, 0.002 microcuries/ml (maximum). Future heavy water shipments will be of "moderate" tritium levels. The levels will range from 0.003 microcuries/ml (minimum) to 0.4 microcuries/ml (maximum). The increase in heavy water tritium levels will also raise the levels in the deuterium gas. Customers should review their specifications. If the tritium levels will be a problem, please have them contact Peggy Hardin (574-3794), R. W. Presley (574-1898), or S. D. Arnett (576-2529).

S. D. Arnett

S. D. Arnett, 9204-2, MS-5

cc: Peggy Hardin, 9103, MS-3
S. W. Lockett, 9103, MS-3
R. W. Presley, 9201-5, MS-9
W. A. Muenzer, 9204-2, MS-5

RA025-02 Y-12 PLANT LABORATORY REPORT

RECEIVED	REPORT DATE	TYPE REPORT	BATCH-NUMBER LOC	MTC	REQUISITIO
09-08-88	10-28-88	FINAL	0060-HI-9003	0060	631643

CHEMICAL ANALYSIS

.200000 G/G D
.995000 G/G D2O

PHYSICAL PROPERTIES

21.00 MCI/L TRITIUM (MICROCURIE/
99.4500 ATOM % D
4.5000 LOG PH

RA025-02 Y-12 PLANT LABORATORY REPORT

RECEIVED	REPORT DATE	TYPE REPORT	BATCH-NUMBER LOC	MTC	REQUISITIO
09-08-88	10-28-88	FINAL	0060-HI-9001	0060	631641

CHEMICAL ANALYSIS

.200000 G/G D
.995000 G/G D2O

PHYSICAL PROPERTIES

27.00 MCI/L TRITIUM (MICROCURIE/
99.4500 ATOM % D
4.5000 LOG PH

RA025-02 Y-12 PLANT LABORATORY REPORT

RECEIVED	REPORT DATE	TYPE REPORT	BATCH-NUMBER LOC	MTC	REQUISITIO
09-08-88	10-28-88	FINAL	0060-HI-9007	0060	631647

CHEMICAL ANALYSIS

.200000	G/G	D
.994000	G/G	D20

PHYSICAL PROPERTIES

20.00	MCI/L	TRITIUM (MICROCURIE/
99.3400	ATOM %	D
5.0000	LOG	PH

RA025-02 Y-12 PLANT LABORATORY REPORT

RECEIVED	REPORT DATE	TYPE REPORT	BATCH-NUMBER LOC	MTC	REQUISITI(
09-08-88	10-28-88	FINAL	0060-HI-9005	0060	631645

CHEMICAL ANALYSIS

.200000	G/G	D
.994000	G/G	D20

PHYSICAL PROPERTIES

18.00	MCI/L	TRITIUM (MICROCURIE/
99.3300	ATOM %	D
4.6000	LOG	PH

RA025-02 Y-12 PLANT LABORATORY REPORT

RECEIVED	REPORT DATE	TYPE REPORT	BATCH-NUMBER LOC	MTC	REQUISITIO
09-08-88	10-28-88	FINAL	0060-HI-9011	0060	631776

CHEMICAL ANALYSIS

.200000	G/G	D
.994000	G/G	D2O

PHYSICAL PROPERTIES

50.00	MCI/L	TRITIUM (MICROCURIE/
99.3200	ATOM %	D
4.7000	LOG	PH

RA025-02 Y-12 PLANT LABORATORY REPORT

RECEIVED	REPORT DATE	TYPE REPORT	BATCH-NUMBER LOC	MTC	REQUISITION
09-08-88	10-28-88	FINAL	0060-HI-9009	0060	631649

CHEMICAL ANALYSIS

.200000	G/G	D
.994000	G/G	D2O

PHYSICAL PROPERTIES

14.00	MCI/L	TRITIUM (MICROCURIE/L
99.3500	ATOM %	D
4.8000	LOG	PH